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COMMUNICATION HORIZONS

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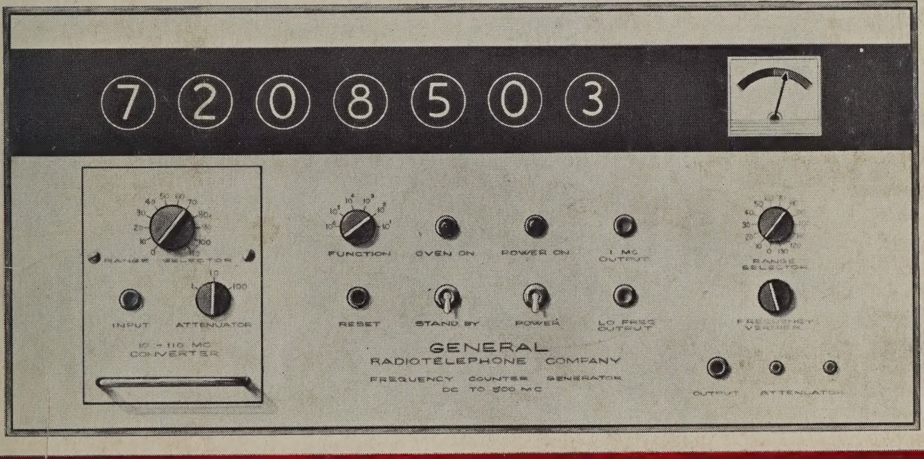

A DIRECT READOUT ELECTRONIC COUNTER-GENERATOR

THE PROFESSIONAL COMMUNICATIONS MAGAZINE

FEATURED THIS MONTH

- CHICAGO'S NEW POLICE RADIO SYSTEM
- DIRECT READOUT ELECTRONIC COUNTER
- HOW'S YOUR TWO-WAY IQ?
- QUIET TONE SQUELCH — HOW AND WHY

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This Colinear Vertical 6 db gain* antenna provides omnidirectional coverage in the 130 - 174 mc range. Gives 4 times the radiated power of your transmitter and is twice as sensitive in receiving. Heavy duty construction throughout with adequate lightning protection. Write for complete listings in Catalog SD-152. (Base Station Antennas)

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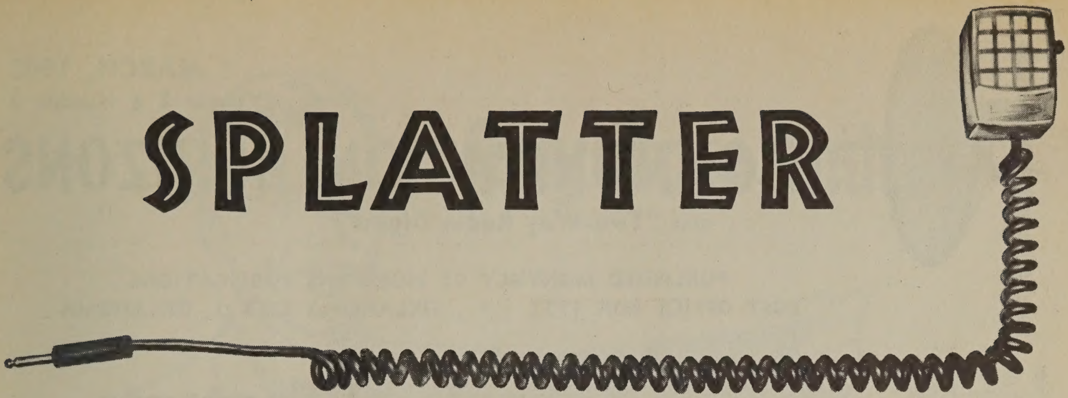


Editorial Notes from
Communication Horizons Editor
Robert B. Cooper, Jr., W5KHT

ACTION - - -

The August and September issues of Communication Horizons carried remarks from the Publisher concerning the various methods in use to measure gain in communication antennas. It was our observation that with no real standard base line for measuring gain in use by the industry, some interim set of reference standards should be adopted and put to use until the VHF-UHF communications antenna industry got around to sitting down at a conference table and discussing the problem at hand. We suggested that perhaps the National Bureau of Standards procedures, which include measurement against a half wave dipole the proper distance above ground, might prove adequate until a more substantial method could be derived by mutual consent within the industry.

We are pleased to report that the Antenna Subsection of the RF Transmission Components Section of the EIA scheduled a meeting for early February and "antenna measurement standards" was on the agenda. The EIA has expressed an interest in standardizing antenna measurement methods (and thereby establishing criteria for antenna gain, pattern, etc. claims and calculations) for some time. With the topic now up for discussion at the industry level, we can only wish God-Speed to the project and hope for an early decision from the group.

Robert C. Bickel, Marketing Manager for the *Andrew Corporation,* heads up the group which includes participants from 15 firms in the professional communications antenna field.

AND - - -

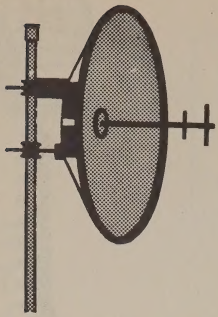
Jermiah Courtney, Communications Attorney of considerable fame from Washington, D. C., spoke before the Professional Group on Vehicular Communications, Washington Chapter, Institute of Radio Engineers, in Washington, D. C. on January 29. Courtney, recently successful in working out a liveable solution with the Richmond, Virginia, City Planning Commission which sought to regulate the height of two-way communications antennas located within that municipality, told the IRE group "The cover editorial in the last (January) issue of *Communication Horizons* was entitled: "Who Speaks for 2-Way Radio?". The question was rhetorical because the Editor had concluded there was no one.

I myself often wondered about that question, too. There are so many voices lifted for the broadcast services, so few for the work-horse mobile radio services. One of the reasons for the disparity is probably the greater knowledge of broadcast, as compared to non-broadcast facts . . ."

If knowledge is truth, and if truth can be considered (hypothetically at least) to be the ultimate winner of any battle, it would appear that Attorney Courtney has challenged the two-way communications industry to pull itself together from within and present a united front to both the government regulatory body (the FCC) and the other interests at large, in general.

Surely if the broadcasters can combine their forces through the NAB, and the amateurs can group their forces behind the ARRL, the two-way

(*Continued—Page* 28)



MARCH, 1962
Volume 2 • Number 3

COMMUNICATION HORIZONS

and **"Two-Way Radio Digest"**

PUBLISHED MONTHLY BY HORIZONS PUBLICATIONS
POST OFFICE BOX 1557 • OKLAHOMA CITY 1, OKLAHOMA

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ADVERTISING
Communication Horizons Magazine accepts commercial display advertising from bona fide manufacturers and distributors of communications equipment and associated apparatus. Advertising rate card and coverage data available upon request.

Eastern-Midwest Advertising Representative
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CIRCULATION
Communication Horizons Magazine is read monthly by nearly 10,000 two-way communication engineers, technicians, salesmen, installers and users. Detailed circulation breakdown available upon request.

SUBSCRIPTION
Subscription rates in the United States, Canada — $4.00 per year. Single copies not available. Subscriptions outside the U.S.A. and Canada — $5.00 per year. Subscription remittances should be made by bank draft or postal money order. Airmail subscription available at $7.00 per U.S. and Canada.

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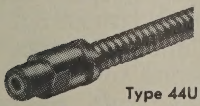
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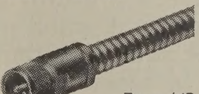
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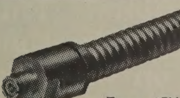
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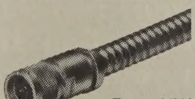
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How's Your Two-Way IQ?

By CARL SCHRANK
Motorola Communications, Inc.

The mere existence of a two-way radio network doesn't guarantee its successful performance. To have it work at top capacity at all times, good procedures must be adhered to in two areas—day-by-day usage and periodic maintenance. One area involves the art of putting radio to work, saving time, money and worries. The other insures that the equipment will work efficiently to effect these benefits.

No matter how well a mobile radio system is designed and built, optimum benefits are derived only after people using it are trained in correct radio procedures and use them at all times. Reading a handbook won't equip a man to handle a radio efficiently, although it will certainly help. Instead, on-the-job training does the trick.

THE DISPATCHER

The person in the best position to give this training is the dispatcher, who reaches by radio into every truck or car with a mobile unit. His position is one of control and responsibility. He should, at every opportunity, enforce circuit discipline and encourage correct operating procedures and terminology.

A man experienced in the organization's overall operations is usually best for the dispatcher's job. He should, first of all, be sold on radio as an effective tool. He must be able to make quick yet calm decisions and make his orders stick.

The dispatcher should have a basic understanding of the radio system's layout, the purpose of its major components, the function of various controls and general microphone techniques. He should know the capabilities and limitations of the network. Experience plus liaison with the equipment manufacturer's representative can solidify this basic knowledge.

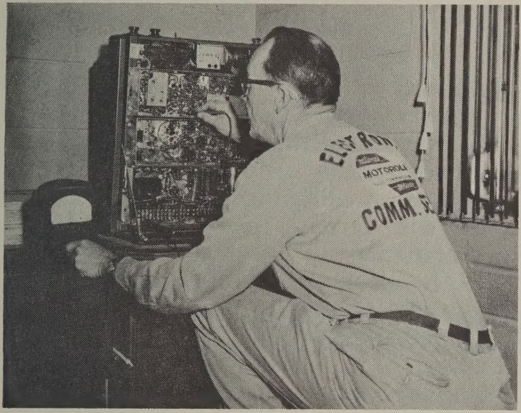
FIELD PERSONNEL

Naturally obtaining full value from a radio system depends on field operating personnel as well as the dispatcher. They should also know what radio is for, what it can do for them and basically how it works. They should know when to call in; if they don't, the dispatcher should prompt them until good habits are developed. Personnel driving radio-equipped vehicles should understand that their decision-making is often up to the dispatcher. They should also realize that radio is not put into their vehicles to spy, but as an efficient tool to help get their work done quicker and better.

The squelch control on a mobile unit is sometimes misunderstood by operating personnel. Since FM mobile radio does not provide a continuous carrier wave, a constant interfering noise level is present when no one is transmitting. The squelch circuit silences the receiver between transmissions by preventing the noise voltages from passing

Looking for a check-out on your two-way habits? This special article, prepared for Communication Horizons by Carl Schrank of Motorola, may re-adjust your thinking on why you approach a given problem the way you do. Could be it's time to sweep some of the cob-webs from your brow and start anew!

through the audio stages and reaching the speaker. The squelch control knob must be advanced clockwise to the point where the noise just disappears. If the knob is advanced beyond this point, however, the receiver will not be sensitive to weak signals. This point constitutes the optimum operational setting of the squelch control.



A thorough program of preventive maintenance catches trouble before it starts and keeps system components, like the base station here, operating efficiently.

VERBAL PROCEDURES

Certain verbal procedures should be adhered to throughout a radio network. First, the channel should be monitored before a transmission is sent to prevent interfering with another message. Allow a second or two after depressing the microphone switch before starting the message. This time could best be used to think out what will be said in clear and concise form.

The spoken message should be slow and distinct. If a word or phrase is used that's particularly important or might be hard to understand, it should be repeated and perhaps spelled to make sure it's received. If the entire message is being written down on the other end, the sender should write as he speaks, on paper or mentally. Adding these few seconds on the first transmission saves minutes of repetitions later on.

A normal tone of voice should be used at all times. Shouting into a microphone creates a choppy or distorted message that's difficult to decipher. However, the competition of background noise tends to stifle a quiet voice. Consequently, a normal voice tone serves best.

EQUIPMENT CHECKS

Periodic maintenance is equally important in squeezing the topmost value from a two-way radio system. This consists of:

(1) Federal Communications Commission requirements;
(2) Emergency servicing when equipment becomes inoperative; and
(3) Preventive maintenance to minimize breakdowns.

At least once each year, the FCC requires that the user of a base or mobile station have each transmitter checked for frequency, deviation and power input. Such checks must be made by a licensed technician holding at least an FCC Second Class Radiotelephone License. Proper operation of equipment is assured by these checks and is always the responsibility of the licensee.

The reason for servicing after equipment failure is obvious. A two-way radio can't "go" anywhere when it doesn't work. Therefore, when a component fails, the only intelligent course of action is to repair the equipment as soon as possible. Because failures do occur, the old adage, "An ounce of prevention is worth a pound of cure", is particularly true.

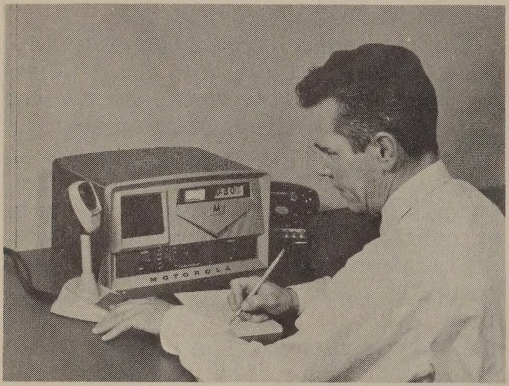
This is where preventive maintenance enters the picture. A two-way radio is a precision electronic instrument composed of hundreds of tiny parts, designed and manufactured to work in unison to provide optimum performance. Subject to field conditions, weather, constant use and rugged treatment, degradation of certain components may ensue. In effect, this reduces performance levels not only of one set but of the whole system. The change is so gradual, however, it may be noticed only by trained technicians equipped with appropriate test instruments.

If you've driven a brand-new 1961 car and say a 1955 model on the same day, you no doubt noticed after only a few minutes behind the wheel the gradual deterioration that's taken place in the older car.

The same applies to a two-way radio network. You may feel the equipment is operating properly, but have you noticed how you have to listen more closely because the audio quality is down? Or how the range of your transmitter seems to be shorter because of slightly reduced power? Taken in total, these little things and others add up to inefficiency.

There are two basic methods of handling preventive maintenance to keep little things from accumulating. Some organizations maintain their own staff of licensed radio technicians to do the work. They have shop space, test instruments, spare parts inventories and sometimes a vehicle for handling on-the-job service calls.

This method is practical for large systems, but demands that the men on the payroll keep abreast of the latest in electronics service. Radio equipment manufacturers offer service clinics to fill this need. One of them, Motorola, supplements its series of nation-wide clinics and in-plant resident schools with a home study course devoted solely to two-way radio. Administered by the Motorola Training Institute, the 38-lesson course covers radio communication servicing from basic designs to complex circuitry and already has enrollment of approximately 2,000 students.



The radio dispatcher is in the best position to train personnel on two-way radio operating techniques.

The other method of maintenance is having the work done by a local electronics service firm. Organizations utilizing this method work either through a manufacturer or directly with the local technician. The direct local method usually involves the minimum FCC checks and emergency servicing done as required on a parts, labor and travel cost basis. A manufacturer's contract, subcontracted to a local firm, on the other hand, provides emergency and preventive maintenance at a regular monthly rate.

As one example, Motorola's most comprehensive maintenance agreement covers the required minimum FCC checks, a complete preventive maintenance program including necessary parts and optional 24-hour emergency service. Work is done by one or several of 800 plus authorized Motorola Service Stations in the United States. It is closely supervised by field service representatives and benefits from the engineering backup of a nationally-known manufacturer who assumes responsibility with the agreement for the system's performance.

Both basic methods of handling maintenance should periodically cover certain specific areas in a two-way radio system to prevent little things from piling up into inefficient operation or complete breakdowns.

TWO AREAS

Two of these areas are particularly important to optimum two-way radio performance, especially "split-channel" systems. These are "netting" and deviation settings.

"Netting" involves accurately tuning each station within a system to the same frequency. Mobile receivers can be readily netted to a base transmitter for best results. However, the FCC requires that all transmitters be set to the assigned frequency using an approved frequency meter.

Similarly, transmitter deviation must be adjusted by means of a suitable meter. The Federal Communications Commission requires that both frequency and deviation be checked on two-way radio systems once a year.

Receiver sensitivity also requires checking to keep a system at peak efficiency. This is determined by a "20 db quieting" measurement, which is a standard method recommended by the Electronics Industries Association (EIA). This requires (1) a signal generator with an accurately calibrated output control and (2) a means of measuring the receiver output voltage at the speaker.

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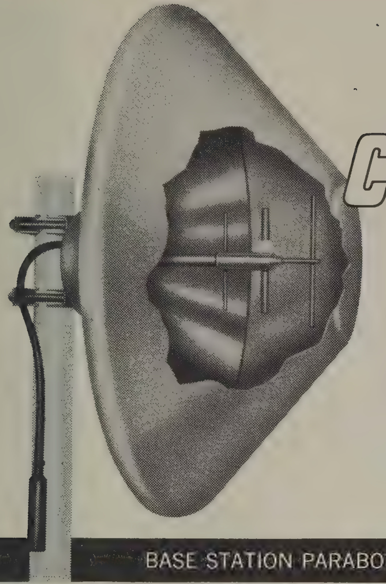

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BASE STATION PARABOLIC ANTENNA (18X Unidirectional Gain)

CAT. Nos. 271-509 and 272-509
FREQUENCY RANGE 952-960 MC

Cat. No. 271-509 Parabolic Antenna consists of 3-element yagi antenna feeding a 27-inch diameter spun aluminum parabolic reflector. It may be mounted for horizontal or vertical polarization using the hardware furnished.

In regions where icing or severe winds are encountered, the antenna is available with a molded fiberglass wind screen and radome. The antenna complete with radome is designated Cat. No. 272-509.

SPECIFICATIONS

Electrical:

Nominal input impedance	50 ohms
VSWR	1.5:1
Bandwidth	±1.0%
Maximum power input	100 watts
Flexible terminal extension	18 in. of RG-8A/U
Termination	Type N male with Neoprene housing
Lightning protection	Direct ground
Vertical beam width (½ power points)	30°
Horizontal beam width (½ power points)	26°
Unidirectional gain	12.6 db

Mechanical:

Radiation element material		6061-T6 aluminum
Reflector material		3003-0 aluminum
Radome material		Fiberglass
Reflector diameter		27 in.
Rated wind velocity	Cat. No. 271-509	100 MPH
	Cat. No. 272-509	125 MPH
Maximum lateral thrust at rated wind	Cat. No. 271-509	170 lbs.
	Cat. No. 272-509	170 lbs.
Weight	Cat. No. 271-509	10 lbs.
	Cat. No. 272-509	12 lbs.

Galvanized steel hardware supplied to mount antenna on 2 in. IPS pipe.

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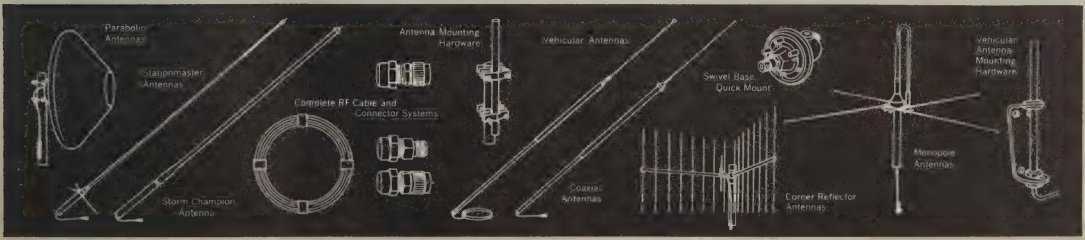
COMMUNICATION ANTENNA SYSTEMS FOR AMERICAN BUSINESS



Without a signal applied, the noise voltage at the output is measured. (The squelch control should be fully open and the volume adjusted for a strong output). An unmodulated channel signal is then applied, with the amplitude increased until the output (noise) voltage reduces to 1/10th of its original value. The total reduction in noise is a 20 db ratio. The amount of signal applied is the sensitivity rating of the receiver. Typical ratings for two-way FM communications receivers range from .4 microvolts for low band units to .8 or 1 microvolt for 450 megacycle band receivers.

Loss of receiver sensitivity can generally be traced to low gain in the RF and first IF stages. This is usually due to tube aging. Most often, a change of tubes in these stages normally will improve sensitivity.

If a change of tubes doesn't help, the receiver alignment should be checked. If this does not provide acceptable sensitivity, then there is evidently a component failure of some circuit. Plate voltages and power supply output should be checked and necessary components replaced to bring voltages back to normal. Stage gain measurements should be compared with charts in the equipment manual to isolate the faulty stage. Within this particular stage, voltage and resistance measurements will locate the defective component.

From the standpoint of overall system performance, the factor of receiver sensitivity is coupled with another important characteristic of radio operation called "ambient noise level". Ambient noise is external noise that gets into a receiver and is amplified the same as the desired signal. It is measured in terms of microvolts of noise, the same as received signals are measured in microvolts of signal strength. For good radio communication, the signal at the receiver must be greater than the ambient noise. When the ambient noise level overrides the signal level, the signals will not be readable regardless of receiver sensitivity.

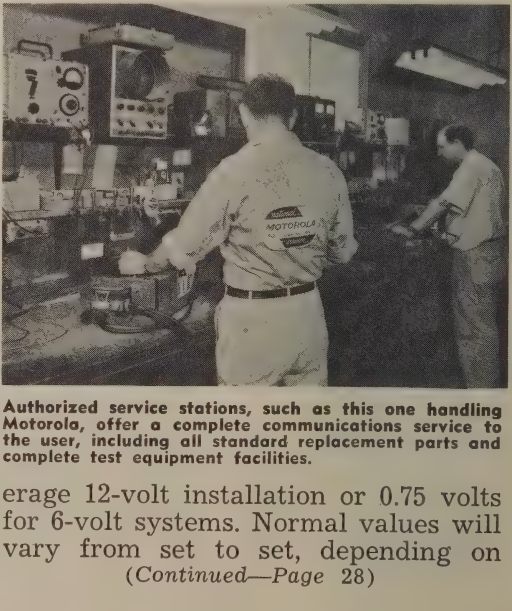
Sources of ambient noise include vehicle electrical systems, RF radiation by other transmitters, power lines, electric signs, etc. If ambient noise from outside sources is particularly high throughout an area of operations, an increase in signal strength will be required to override the noise. Usually a two-way radio system's radius includes points of both high and low ambient noise level.

ELECTRICAL SYSTEM

A vehicle's mobile radio requires a properly operating electrical system for top notch performance. Batteries, generators and voltage regulators should be checked periodically by competent electrical system maintenance men. In a nominal 12-volt system, the value of 13.8 volts is the EIA "design center" — the voltage at which the stated performance specifications are guaranteed. For a 6-volt system, the figure is 6.6 volts. The specifications apply to voltage variations 10 percent either side of these values.

With the supply system properly maintained, it is still possible that the voltage at the input to the radio is insufficient for proper operation. This indicates too great a line drop in the power cabling to the radio set.

Total line drop is determined by checking voltages, first at the battery terminals, then at the input to the radio set. An accurate DC voltmeter is essential to this test, made with the engine turned off and the radio transmitter on. Generally speaking, the total drop should not exceed 1.5 volts for the average 12-volt installation or 0.75 volts for 6-volt systems. Normal values will vary from set to set, depending on



Authorized service stations, such as this one handling Motorola, offer a complete communications service to the user, including all standard replacement parts and complete test equipment facilities.

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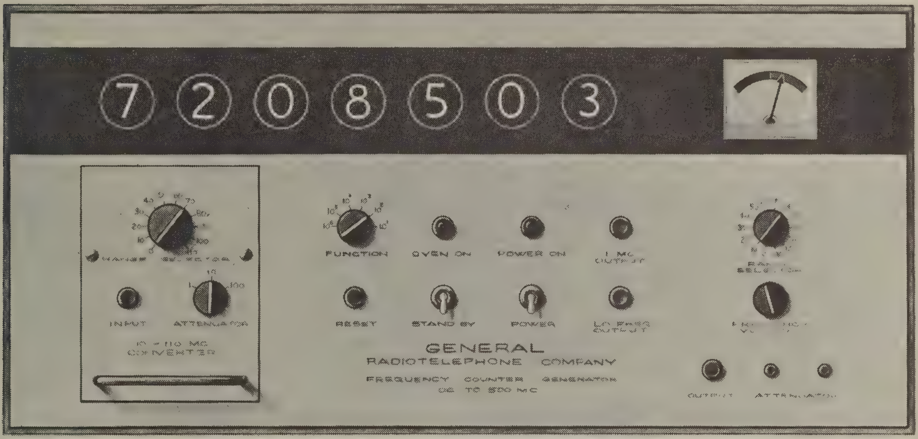
EXCLUSIVE PRODUCT RELEASE

Direct Readout Electronic Counter-Generator



from

General Radiotelephone Company

Burbank, California

Ever wished you had a direct readout counter-frequency generator that read DC to 500 megacycles with short term frequency accuracy of 2 parts in 10^8?

Wish no more. General Radiotelephone, 2806 W. Burbank Blvd., Burbank, California has just completed tooling for production of such a unit and Communication Horizons is fortunate to have the scoop for the two-way industry.

General's frequency counter-generator is believed to be the first time an all band Generator has been incorporated into an Electronic Counter. By reading out the generated frequencies on the self contained counter, accuracy of 3 parts in 10^8 may be obtained throughout the entire range. General states that this results in the most accurate variable frequency generator ever built and made available to the communications engineer.

The counter section will read any frequency from DC to 500 megacycles. Plug-in converter units are utilized for the various ranges covered. Readouts are displayed by a newly developed flat-face counting tube with numerals ¾ inch high, and provide ample brillance for easy reading even in well lighted areas. Frequency accuracy is 2 parts in 10^8 short term and 5 parts in 10^8 per week. The generator section has a range from 100 kc to 250 mc.

This new line of endeavor for General has evolved from a long term developmental program designed to meet the anticipated heavy demands for more accurate measuring equipment with the new FCC split channel requirements. General told Communication Horizons *we feel the enormous number of new firms offering two-way communications equipment has created a demand for a reasonably priced piece of equipment of this type.*

Delivery is slated to start in April, with a tentative price of $995.00 per unit. F.O.B. Burbank. General manufactures a line of Citizens Band equipment, and is expected to formally announce a new high band two-way unit shortly.

QUIET TONE SQUELCH SYSTEM

By **MARTIN GOLDEN, Engineer**
The Hammarlund Mfg. Company, Inc.
New York, New York

Editor's Note:
This paper by Engineer Golden, while basically a commercial presentation for the new Hammarlund-Outercom QT squelch system, carries a very well worded message on some of the problems inherent in designing an effective squelch system for any mobile installation. We believe the excellence of the depth of the report far overshadows any commercial overtones it may carry on behalf of the writer's employer.
Communication Horizons

A new and effective way of relieving the two-way radio dispatcher from the annoying background noise and chatter that adds to operator fatigue, has been developed by the Hammarlund Manufacturing Co., Inc., to be used in the Outercom two-way mobile communication units.

During the embryonic days of the industrial two-way radio, when there were not many users, the squelch control was sufficient to quiet a receiver during the absence of communications between the base station and mobile units. As more and more users bought two-way radio, the once seldom used channels came alive with a beehive of activity, as many services took to using the same frequency on a shared basis.

To make room for the increasing growth of two-way radio users, the FCC limited the channel width to ±15 Kc, and in some cases to ±5 Kc, with corresponding closer spacing between channels. The reduced channel spacing increased the possibility of an adjacent channel transmitter opening the "on frequency" receiver. This phenomenon known as "adjacent channel interference" will occur, to some degree, in the best designed receivers manufactured today. This condition will occur when the interfering signal is either one channel higher or lower than the desired channel and the proximity of the antennas is such, that the signal from the interfering station is strong enough to open the squelch of the "on frequency" receiver. This condition is illustrated in figure 1a. The drawing shows a typical selectivity curve of a mobile receiver. The line marked "A" represents the desired transmitted frequency. The line marked "B" represents a high adjacent channel transmitted signal, and the "C" line represents the lower adjacent channel transmitted signal. You will notice that the upper adjacent channel signal is not strong enough to open the squelch since it does not fall within the selectivity curve of the receiver. The lower adjacent channel signal however does fall within the curve and can cause interference with the "on frequency" receiver.

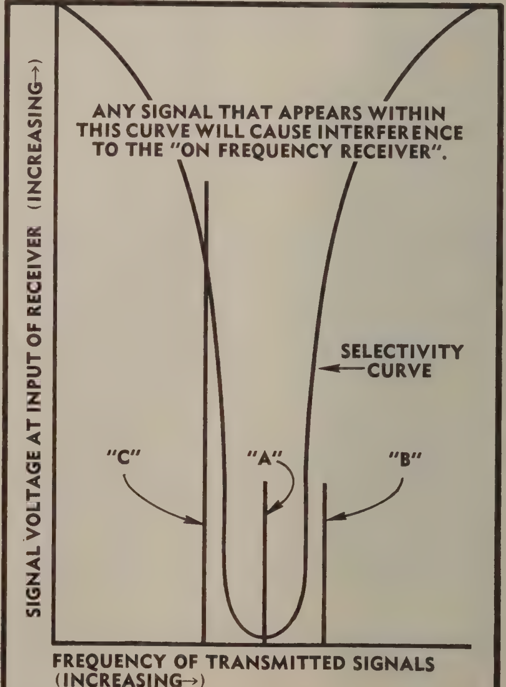

SIGNAL VOLTAGE AT INPUT OF RECEIVER (INCREASING→)
ANY SIGNAL THAT APPEARS WITHIN THIS CURVE WILL CAUSE INTERFERENCE TO THE "ON FREQUENCY RECEIVER".
SELECTIVITY CURVE
"C"
"A"
"B"
FREQUENCY OF TRANSMITTED SIGNALS (INCREASING→)

FIGURE 1A

Figure 1b, illustrates the reason for this. The power output of transmitter

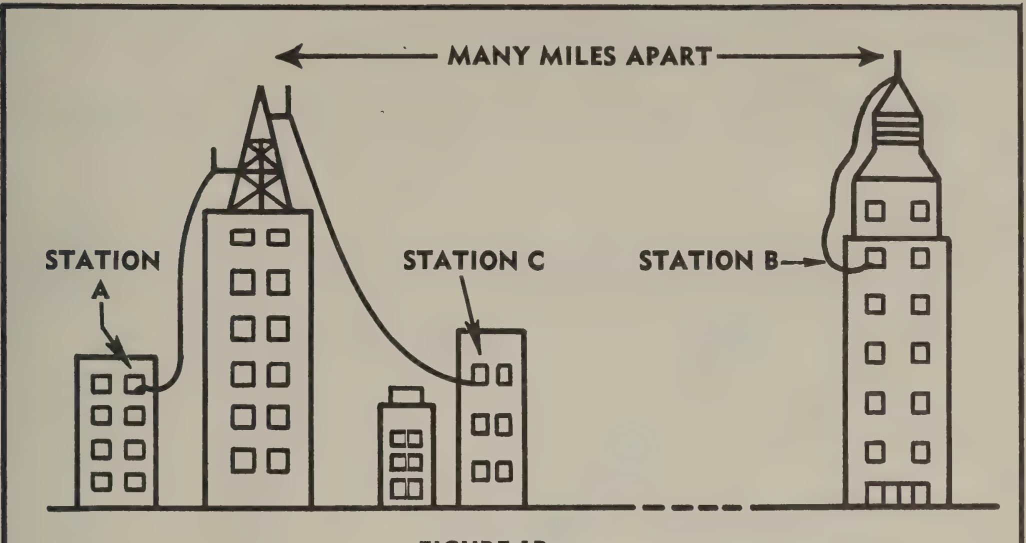


FIGURE 1B

B is greater than the transmitted power of station C. The antenna of station B is in a different location than station A and therefore the signal at A's receiver will not be strong enough to open the squelch. On the other hand, even though station C is a low power station, the closeness of A and C's antennas will cause a strong signal to be present at A's receiver and open the squelch.

Until now, this situation has been tolerated because physical restrictions frequently confine the antennas of many stations to one area.

Another bothersome condition that adds to the annoyance of two-way radio users is skip signals which open the receiver. Previously nothing could be done to eliminate the effect of these signals, as they are on the same frequency as the receiver that is being interfered with, and must be "lived with." These signals originate in locations that are geographically separated from the receiver by hundreds of miles, but due to the peculiarities of very high frequency radio waves and atmospheric conditions, they are received by communication units tuned to the same frequency. The strength of these skip signals may be equal to that of the local system's signal and may cause confusion for the dispatcher if they are not prevented from reaching him. Figure 2 illustrates how skip signals are received. The reflecting layers are mediums that cause VHF signals to be bent and returned to earth at points far removed from their origin.

The layer marked F_2 will cause signals that originate at station A to be heard in receiver D, 2000 miles away. The E layer can cause signals to be heard in receivers 1500 miles away from the origin. A condition, known as double skip can increase the distance covered to 3000 miles. "Close bending" of VHF signals is also caused by airmass boundaries which will cause interference 50 to 400 miles away from the transmitting station.

With all of these interference conditions in mind, the radio operator fatigue factor has increased to a point where the two-way radio users have asked for some assistance from the radio manufacturers, to help eliminate all unwanted noise coming from their receivers. The squelch control does only part of the job, it works fine in eliminating background noise that is generated by the high gain tubes that are in the front end of the receiver, but something else is needed to help the dispatcher *sort out his* calls from *all the others*. Nothing can cause the operator fatigue index to go up faster than the dispatcher having to monitor *all the chatter* on his channel to prevent "lost" messages.

As the state of the art of two-way radio advanced, so has engineering.

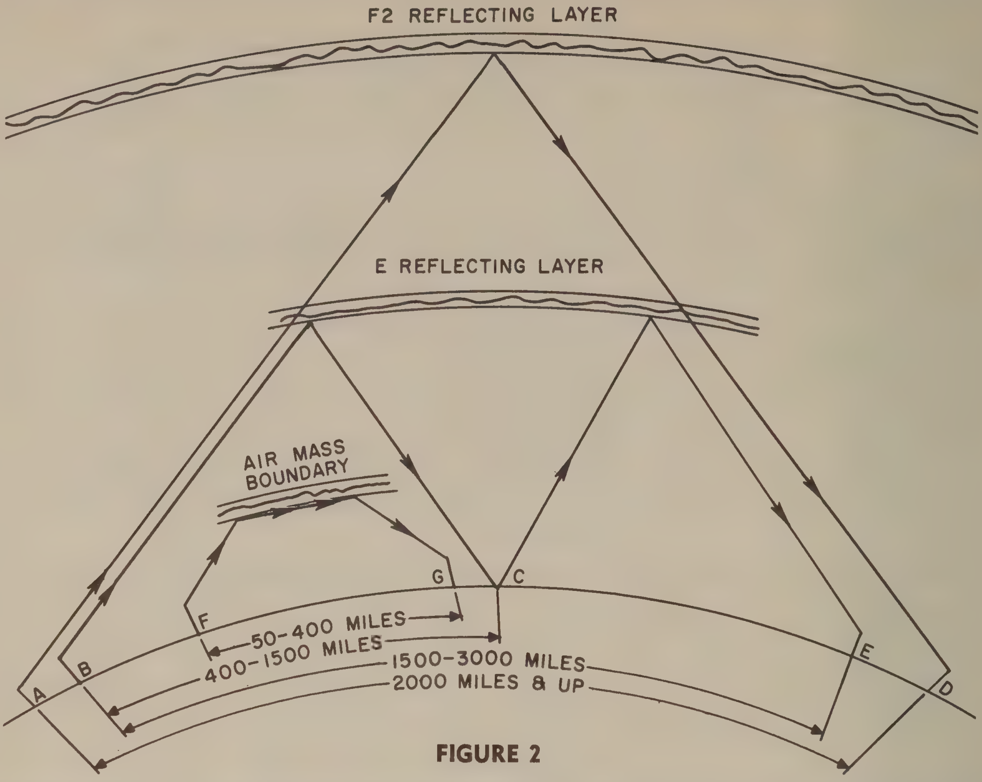


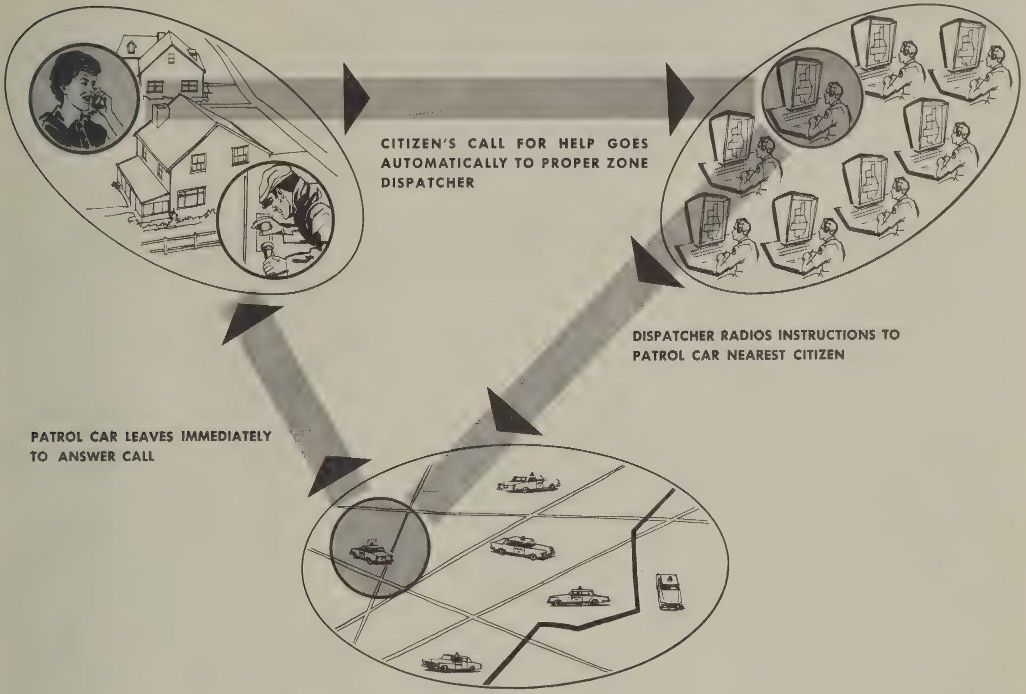
FIGURE 2

The design philosophy of "keeping the equipment simple," has resulted in sophisticated thinking to achieve an end product at Hammarlund, the "Q-T Tone Squelch." Q-T means quiet tone; and the equipment does just that, the receiver remains quiet until it is called by a transmitter coded with a tone akin to its own system.

The Q-T system works as follows: The mobile operator wants to call the base station whose receiver is in the quiet condition, no background noise, no unwanted shared channel signals, no skip signal, —*quiet*—, he merely lifts his microphone, presses his press-to-talk switch and calls his base station such as, "car one five to base," and waits for the base station to reply. When he pressed his press-to-talk switch, the Q-T Encoder sent out a very short tone burst which when received by the receiver, activated it for 7 to 13 seconds. This is long enough for the Base Station operator to be made aware that there is a call for him. He answers the call in the following manner: First he presses his press-to-talk switch half way down. In this position the receiver goes from the quiet condition to a listen and monitor position. If he does not hear another station transmitting on the channel, he puts his transmitter on the air by pressing all the way down on his press-to-talk switch. When the operator is finished with his message and releases the press-to-talk switch, the receiver goes to a listen position, and the normal press-to-talk release-to-listen operation takes place until the entire message is completed. When the communication between the two units is completed and the base station operator desires to go back to the quiet condition, he merely releases the press-to-talk switch from the listen-monitor position to the quiet position. This is done by moving a lever near the press-to-talk switch which releases the hold detent and allows the switch to be spring returned to the quiet position. If this automatic feature is not desired by the user, a

(*Continued—Page 26*)

Chicago Police 2-Way Radio Network Speeds Handling Calls



CITIZEN'S CALL FOR HELP GOES AUTOMATICALLY TO PROPER ZONE DISPATCHER
DISPATCHER RADIOS INSTRUCTIONS TO PATROL CAR NEAREST CITIZEN
PATROL CAR LEAVES IMMEDIATELY TO ANSWER CALL

Its first few months of operation have proved the value of the new Chicago Police Department communications network.

Put into operation last November, the new network is providing the speed necessary to handle emergency calls.

The most modern police communications system, designed to provide lightning-swift action in handling every citizen's call, was one of O. W. Wilson's most pressing goals when he took over the reigns of the Chicago Police Department in mid-1959. Superintendent Wilson's new communications set-up replaces a four-channel system with a 27-frequency network combining zone and city-wide radio channels, comprehensive telephone connection and a Communications Center unlike any in existence.

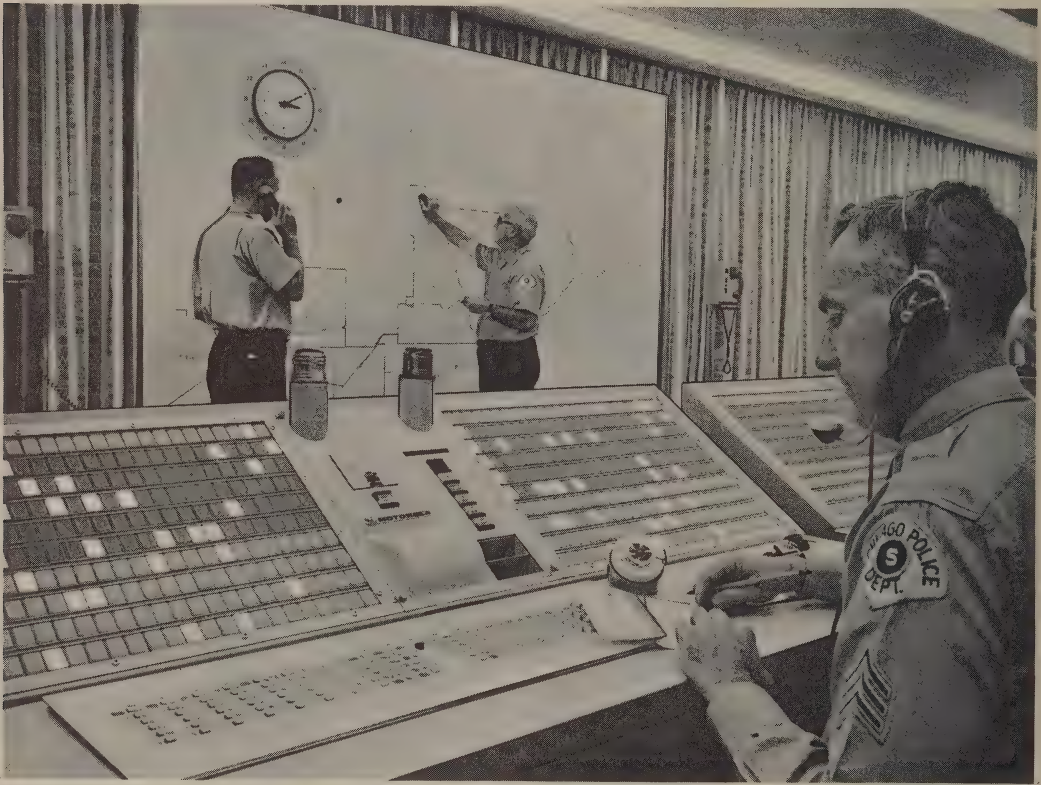
Under the old system, the highest number of calls that could be handled at any given time was 10. The new system provides for simultaneous handling of 28 incoming calls. The difference comes primarily in the number of channels available and the means of getting calls directly to the dispatcher controlling the patrol cars in the best position to handle them.

With the new system, the city is divided into eight zones. All calls from citizens go directly and automatically to one of three dispatchers coordinating vehicle movement within the zone the caller lives in. Eliminated right away is time-consuming telephone switchboard screening.

The zone dispatcher answering the call has before him a large display map which pinpoints all patrol cars within his zone and tells him whether the cars are in service or available for assignments. Each patrol car is represented by a light. When the light is on, the car is available.

Receiving a call, the dispatcher checks the console map to see which patrol car is available nearest the scene of the request. Then he removes a punched card from a storage slot, quickly fills in the initial report while radioing the car to the scene, and places the card in a slot corresponding to the number of the patrol car. This extinguishes that car's light so the dispatcher knows the vehicle is on a call.

With only seconds having passed, the dispatcher resumes his telephone conversation with the citizen, securing additional information, which is relayed to the moving police car.



Close-up view of city-wide console with magnetized map in background. City-wide console includes 500 indicator lights, each representing a mobile unit in action. The two lights in center console are for indicating an emergency and for signaling a messenger.

When the assignment has been completed, the patrol car radios in so the dispatcher can remove the punched card, turning the patrol car light back on. The card is relayed to the comprehensive Records Section via a messenger.

Simultaneously, calls can be coming in to all eight zones, each being handled instantly.

To establish fast contact between cars and the dispatchers at the Center, 16 frequencies are used—one pair for each of the eight zones. Base stations dispatchers transmit on UHF frequencies and receive on VHF band frequencies. Mobile units in the zones transmit and receive on the opposite arrangement. This technique is known as "crossbanding."

The new Chicago police network provides speed in handling emergency and pursuits which extend beyond zone boundaries. This is accomplished through a city-wide channel. All patrol cars are actually equipped to operate on the city-wide pair of frequencies in addition to their particular zone set of channels. In an emergency extending beyond a zone, the dispatcher alerts the cars to switch to their city-wide channel.

Coordination of the city-wide pursuit is accomplished from one of two 8 by 12-foot magnetized maps located in the Communications Center. Two dispatchers direct and record the activity.

(*Continued—Page* 17)

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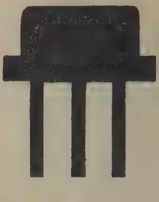
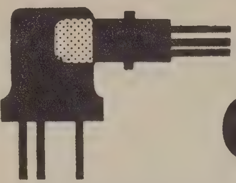
AEROTRON

SOLID STATE COMMUNICATIONS





Donald L. Stoner
D. L. Stoner Associates
Alta Loma, California

One of the most interesting new techniques to be developed for communications purposes is that of parametric frequency multiplication.

Many readers will no doubt be familar with parametric amplifiers for they have been covered extensively in technical journals. This system utilizes the reactance of a variable capacitance diode to amplify very low level signals with a minimum introduction of system noise. Using parametric techniques, it is possible to obtain noise figures in the vicinity of 1 db without elaborate cooling mechanisms.

Less well known is the parametric frequency multiplication technique. It is widely used in satellite communications where the ultimate in system efficiency is required. Although usually associated with solid state circuitry, the technique is equally useful in vacuum tube equipment.

In this system, the driving power is used as a source of alternating voltage (see fig. 1). Assume that the driving source causes a current to flow through the parametric diode and the load. The alternating voltage, represented by the r.f. cycles of drive, causes the capacitance of the parametric diode to vary. This, in turn, changes the resonant frequency of the output tank circuit, thereby distorting the signal. This distortion, as in any other circuit, causes harmonics to be produced. However, unlike class C circuits, a clipping process is not involved. Since the reactive device (the diode) returns energy to the output tank, extremely high efficiencies are possible.

For a practical example of how the parametric frequency multiplication technique might be used, assume that a driving source of 10 watts of r.f. is available on 155 mc. This energy is used to drive the parametric multiplier, tuned to emphasize the third harmonic component. Depending on the quality of the diode and the care in constructing the circuit, it should be possible to obtain five to eight watts on 465 mc. The frequency deviation, in an f.m. system, would of course be multiplied by a factor of three.

With suitable filtering this circuit could be used to feed an antenna system directly, or provide considerable drive for a high power amplifier tuned to the output signal frequency.

The theoretical power handling capabilities, with present day parametric diodes is approximately 4 watts. However, in practice it can be demonstrated that powers up to five times the theoretical maximum are possible. The maximum efficiency, obtainable may

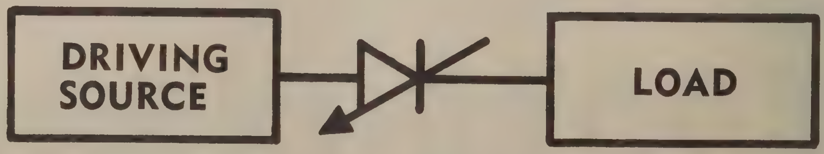


FIG. 1

be as high as 80%, depending on the harmonic selected. Efficiency reaches a maximum with approximately 12 watts of drive.

A typical doubler circuit is shown in fig. 2. Capacitors C1 and C2 provide input matching, while L1 forms a modified pi-network to match the impedance of the parametric diode. The diode is back-biased from a 15 volt source to establish the nominal junction capacitance. The output circuit consits of a parallel tuned trap to prevent fundamental energy from flowing in the output tank. This is necessary both from a standpoint of undesired harmonic output and circuit efficiency. Components L3, C3 and C4 provide output impedance matching. The exact inductive and capacitive values will depend on the frequency of operation.

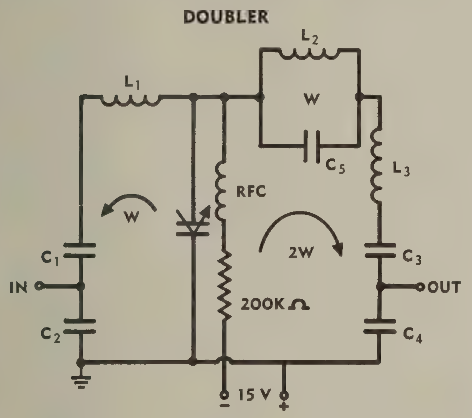


FIG. 2

Diodes used in this type of equipment are of the abrupt junction variety and are manufactured to exhibit extremely high "Q"s at the signal frequency and large changes in capacitance with small voltage variations. "Q"s in the order of 150 (4 volts as 50 megacycles) are possible.

Recent space systems have used this technique to above 2 Gc. Laboratory experiments indicate that several watts at frequencies up to 10 Gc. are possible. In solid state systems it is customary to generate as much power, on as high a frequency as possible with transistor circuitry. From this point, parametric multipliers (either doublers or triplers) are used until the desired operating frequency is reached. Although each multiplier stage will be only, say 70% efficient, the circuitry will require far less power input for a given power output, when compared to vacuum tubes.

Varible Capacitance Diode
(photo courtesy of Pacific Semiconductor)

Pacific Semiconductors, Inc., 12955 Chadron Avenue, Hawthorne, California, have done considerable work in this growing field. Additional design, technical and engineering information is available from this firm.

CHICAGO 2-WAY

(*Continued From* 14)

One uses a handset installation to relay instructions to cars while the second plots the locations of all cars on the map. He follows the action through a headset, using discs to represent each vehicle.

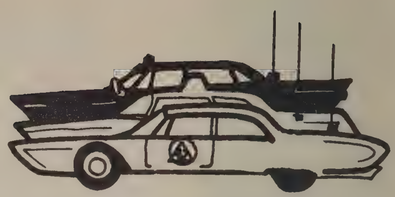
In addition to zone cars, the vehicles of other departments within the Chicago Police force, such as Traffic, Command and the Detective Bureau, can be tied into the pursuit through simulcasting.

Four handset installations alongside the two large maps permit simultaneous coordination of four pursuits throughout the city.

Two additional city-wide pairs of frequencies bring the total number of channels used in the crossbanding setup to 22—eight pairs of zone channels and three pairs of city-wide channels. The second city-wide pair is used to coordinate movement of vehicles assigned the Traffic Bureau, and the third is used by the special forces such

(*Continued—Page* 19)

PUBLIC SAFETY COMMUNICATIONS



Material Prepared and Submitted by
ROBERT E. BROOKING
Communications Engineer
City of Burbank, California

Last month, the subject of communication by radio with hospitals was raised. The subject came to light as the result of a direct question, "We have a hospital in our city that wishes to establish a radio station on one of the new frequencies available to hospitals so that they can communicate with Civil Defense. How do we go about this?"

As mentioned previously, the complete answer is much more involved. Perhaps it would be wise to first determine exactly what is intended. The Civil Defense Director who asked the question explained that in case of enemy action or a serious natural disaster such as a strong earthquake, wire facilities between the City Hall and the hospital might very possibly be knocked out and there should be some means of contacting the hospital by radio for just such emergencies. With this bit of logic, there could be no argument. It would certainly be in the City's interest to provide such a facility. My first question, "Are we talking about a private hospital or one operated by the City or County?" "A private hospital," was the answer. "Very well," I said, "in either case we can handle this in one of two ways; the only difference being that in the case of a private institution, certain lease agreements must be signed and the radio can be used only for Civil Defense or other purposes which are City business." This is necessarily so, because the licensee (the City) must retain control of the radio installation.

The City of Burbank has found it advantageous to install radios in hospitals under its R.A.C.E.S. plan. These units operate in the 220-225 Mc amateur band and are 10 watt AM transmitters and receivers (fixed tuned, crystal controlled). These units may be operated by any person who is a member of Civil Defense and holder of a Restricted Radio Telephone Operator Permit or better. Operation is limited to tests or drills and actual emergencies involving Civil Defense. The 220-225 Mc amateur band provides circuits which cover the City adequately and are relatively free from interference. After explaining this system, the comment was added that such a system would be eligible for Federal matching funds since its primary purpose would be for Civil Defense.

There seemed to be some doubt that this was the desired answer; that "frequencies for hospitals still came up. So, a second method was proposed. Since the City has a Local Government frequency, it would be possible to license an additional base station at the hospital by having a lease agreement between the hospital and the City. The radio equipment would be and must remain under City control. It could be used only for such communication as would fall under the category, Civil Defense or such other communications as could legally be considered City business. For example, if the City operated its own ambulances and this hospital provided emergency medical care for these ambulance cases, then the ambulances would operate on the Local Government frequency and the hospital could communicate with them. Likewise, if the City contracted with an ambulance service and a hospital to provide emergency medical care, then by lease agreements both could use the Local Government frequency but only for City business. I was about to suggest that on such an arrangement matching funds applications would be much too complicated for me to discuss but frowns indicated that what I had proposed was not in accord with the thinking of those present. "Alright," I said, "you tell me what you would like to do."

Now the story came out. The hospital wanted to establish a radio station at the hospital with mobile units in the vehicles operated by the hospital and also in the cars of physicians using the hospital. Fine; an excellent idea and quite proper on one of the hospital frequencies but where does Civil Defense enter the picture? "Well, this would all be part of the City's Civil Defense Medical Plan. Naturally, there would be a radio link to the Civil Defense Office. This would be a requirement of the plan."

Under Section 10.460 (c) Special emergency fixed stations are authorized to intercommunicate with other stations in the Public Safety Radio Services. Likewise under Section 10.553 (c) Local Government licensees are authorized to do the same. So, by installing receivers at the Civil Defense Office and the hospital to pick up the other radio system, they could then intercommunicate. This was carefully explained including the fact that it should be possible to obtain matching funds for the receivers. This would provide the necessary communications link between the hospital and the City. If more than one hospital is involved, it would require an additional receiver at each additional hospital since they will probably share a common frequency in a given area. The next question asked concerned the eligibility of physicians to use the hospital frequencies. Section 10.453 of the Commission's Rules covered physicians but left some doubt on how such licensing might be accomplished. So the Second Report and Order in the Matter of Docket No. 13273 was brought out for reference. In Para. 8, the Commission states "that 5 frequencies in the 152-162 Mc band be made available to hospitals and ambulances on an exclusive basis." The Commission's statement continues: "Of course, hospitals could elect to place units in the cars of staff physicians and also (under an appropriate agreement pursuant to Section 10.7) in the vehicles of other doctors." This would make it possible for the physicians to have mobile units on the hospital frequency but the base licensee would be the hospital and the agreement should indicate said licensee would be in control of such mobile units. "But what about the City holding the license?" "Unless it is a City owned hospital—no;" we concluded, explaining that our knowledge was limited to Commission matters such as Rules and licensing; therefore to any questions beyond this point we must plead ignorance. We were preparing to leave when someone thought of another question. "How do we get one of these frequencies?" "You clear it by letters of concurrence, just like Local Government and the primary users are in the Police Radio Service," I said. Somebody muttered, "Seems to me I've heard that before."

CHICAGO 2-WAY

(Continued From Page 17)

as the Detective Bureau, Youth, Command and Task Force.

In all, there are 36 specially-designed Motorola consoles in the Communications Center. Eight zones with three consoles each brings the total zone consoles to 24. There are six city-wide consoles to coordinate activity on the three city-wide channels; four telephone answering consoles to handle any overflow of calls such as might occur should an extensive number of persons report the same fire or explosion in the city; a supervisor's console which enables the communications supervisor on duty to monitor any of the channel; and a point-to-point console to establish contact with the state police and various suburban police departments.

The contract with Motorola covering the new system included manufacture of the 36 special radio-telephone consoles; supply of 885 two-frequency "crossband" and kits to convert 600 mobile units already-in-use for crossband operation. It also included 22 250-watt RF output base stations, located throughout the city, and three satellite stations. Provisions for operating the base stations locally at the various sites are included.

Manager of Communication Horizons' Washington Office, Robert E. Tall, reports on the past month's communication activities

39.06 FINAL FOR TRAFFIC LIGHTS

In a public safety rulemaking proceeding shunting aside opposition of both the Associated Public-Safety Communications Officers (APCO) and the International Municipal Association, the FCC has concluded that there is "demonstratable immediate need for the control of traffic signals in emergencies by emergency vehicles using low power equipment." With this, the FCC marked the frequency 39.06 for such use in the local government radio service.

Both APCO and ISMA, in collaboration with the International Association of Fire Chiefs, had supported the theory of the operation, but had objected to the use of 39.06 mc on the grounds that the police frequency should not be made available to the local government service, in view of the low power police surveillance operations being conducted on 39.06 mc.

The group had asked that a new split channel in the local government service be made available for the three-watt operation, instead. The Commission, however, in its report and order, held that "in view of the fact that the frequency 39.06 mc now contains a 3-watt limitation, and has been sparsely used by the police radio service, it appears that shared usage by that service and the local government radio service—both consisting of government entities—is feasible and in terms of frequency coordination, is desirable."

FCC BUDGET OF $13,100,000 PROPOSED

An increase in the FCC's budget for the fiscal year, beginning July 1, to $13,100,000 compared with the $12,508,000 appropriation for the current year, was proposed by President Kennedy during the annual message to Congress January 18.

For the Safety and Special Radio Services FCC activities, a relatively small increase to $1,451,000 from the fiscal 1962 figure of $1,385,000 was proposed. The major increase over this year's figure for the FCC as a whole is in the field engineering and monitoring fund, for an additional monitoring operation in Puerto Rico.

For the Safety-Special field, the budget estimates the Commission will receive 426,000 applications in the 1963 fiscal year, compared with 408,000 in 1962 and 393,000 in 1961.

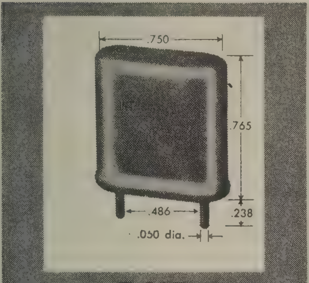
ORAL ARGUMENT ASKED— FLORIDA FCC HEARING

Birmingham, Alabama attorney Mayer U. Newfield has asked the FCC to schedule an oral argument on Examiner Forest L. McClenning's initial decision which would deny applications of Charles P. B. Pinson, Inc. and James C. Fields involving common carrier radio operations in four Florida cities.

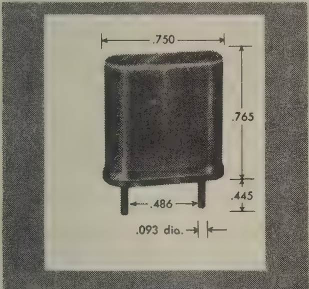
The FCC Common Carrier Bureau, meanwhile, replied to the Pinson-Fields exceptions to the initial decision, with the comment that they "are substantially frivolous, of no decisional significance, and totally devoid of relationship to the basic substantive issues dealt with in the case."

FCC Attorney Lawrence M. DeVore contended that the Pinson-Fields ex-

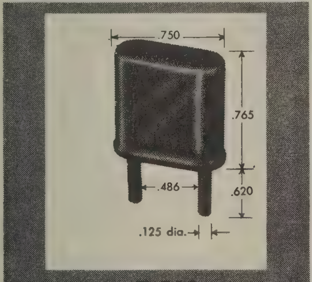
Custom made CRYSTALS



F-605



F-609



F-612

FREQUENCIES 70 KC TO 137 MC

DESCRIPTION AND DATA:

All of these crystals are of the plated, wire-mounted type. Low drift AT-cut blanks are used in these units above 500 KC, and low drift DT and CT-cut blanks are used in units below 500 KC; any crystal can be supplied for operation with or without an oven.

TEMPERATURE TOLERANCE:
AT—±.005% from —55° to +90°C.
±.002% from —30° to +60°C.
DT-CT—±.01% from —40° to +70°C.

CALIBRATION TOLERANCE:
Supplied to meet equipment manufacturers speifications and may be as close as .001% without oven or .005% with oven. Where no equipment is specified the following will apply.
AT— .0025% of nominal at +30°C.
DT-CT— ,01% of nominal at +30°C.

DRIVE LEVELS:
Maximum, AT—
10 milliwatts 500 KC to 999 KC
4 milliwatts 10,000 KC to 24,000 KC
2 milliwatts 25 MC to 137 MC
DT-CT—2 milliwatts

CIRCUIT: As specified by customer. Crystals are available for all major two-way equipment and in most cases the necessary correlation data is on file. Where circuit is not specified, the crystal will be calibrated for operation into a load capacitance of 32 mmf.

FREQUENCY RANGES AND MODES OF OPERATION

200-500 KC:
Operates on fundamental edge shear oscillation. Load capacitance 32 mmf . . . or as specified by customer. If load is not known specify circuit or equipment in which crystal will be used.

500-20,000 KC:
Operates on fundamental face shear oscillation. Load capacitance 32 mmf . . . or as specified by customer.

10-60 MC:
Operates on third mechanical overtone at anti-resonance. Will give reasonable output in tuned circuit.

60-100 MC:
Operates on fifth (or seventh) mechanical overtone at series-resonance. Drive level must be kept below 2 milliwatts.

ONE DAY SERVICE

Orders for less than five crystals are shipped within one working day following receipt of order (except low frequency and special crystals which require 10 to 30 days for processing). Orders received on Mon. thru Thurs. will be shipped the day following. Orders received on Fri. will be shipped the following Mon. Postage is prepaid within continental U.S. when cash accompanies order. All others are shipped F.O.B. Oklahoma City.

SUPPLY THIS INFORMATION WHEN ORDERING

MOTOROLA: Crystals can only be properly correlated for Motorola equipment if the crystal type number is given. Example: D02, R28, D03, etc. In cases where crystals are required for type D-14, 800 and 801 holders, always specify crystal frequency or the high IF frequency. Check whether the crystals are to be used in ovens.

GENERAL ELECTRIC: Specify model number of transmitter and receiver RF Decks. Example: 4ES13A3, 4ER24B1, 4ET5B3, etc. When ordering crystals for 450 MC equipment specify:

Receiver Crystals:
A. If they are heated or non-heated.
B. If the unit is AFC or NON-AFC Controlled.
C. Platter number of present receiver deck.

Transmitter Crystals:
A. If they are heated or non-heated.

R.C.A.: Specify model number of unit or MI Number of the crystal. Always indicate whether crystals are to be non-heated or heated type.

OTHERS: Specify model number of the receiver and transmitter as well as any formulae that pertain to the correct crystal calculation.

PRICES — F-605, F-609, F-612 CRYSTALS

Fundamental KC		Fundamental KC		Overtone MC	
200 - 499*	**$12.50**	3000 - 3999	**$5.75**	10 - 34.99	**$ 6.50**
500 - 849*	**15.00**	4000 - 5999	**5.00**	35 - 44.99	**7.00**
850 - 899*	**13.50**	6000 - 9499	**4.50**	45 - 60	**8.50**
900 - 999*	**12.50**	9500 - 10999	**5.00**	61 - 75	**10.50**
1000 - 1499†	**9.80**	11000 - 14999	**6.30**	76 - 137	**15.00**
1500 - 1999†	**7.50**	15000 - 20000	**8.00**		
2000 - 1999	**6.50**				

*Allow 10 to 30 days for processing. †Allow 2 to 3 days for processing.

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ceptions "do not, in any way, establish that there has been anything improper about the examiner's conclusions to the effect that there has been an unauthorized transfer of control and ownership of Fields' station KIK578 to Pinson; that Pinson testified falsely; that neither applicant was qualified to be a licensee; or that, on a comparative basis, Rosenson was the more qualified applicant than Fields."

TELEMETERING COMMENTS NOW DUE FEB. 28

A new extended comment deadline, this time Wednesday February 28, has been announced by the FCC for comments concerning the medical application of telemetering devices in connection with Commission proposals to amend Part 15 of the rules to make the 88-108 mc band available for use by low power telemetering devices and wireless microphones. *Reply* comments may be filed by March 12 under the new timetable.

COURTNEY SUGGESTS CHANGES IN ALLOCATIONS

Washington communication attorney Jermiah Courtney, in a speech before the Washington, D.C. Chapter of the IRE's Professional Group on Vehicular Communications during late January, suggested that the FCC develop "methods of administration that will lead to maximum use of the available spectrum in order to meet all needs of all types (of radio use), and without regard to rigid initial allocations patterns."

While a departure from the rigid initial allocations patterns of the land mobile radio services, he said, "raises the bogey of 'administrative difficulty', there is a direct relationship between administrative problems and the importance of the objective. If the objective is to be gained is of prime value, then the administrative problems (connected with the licensing) must be viewed simply as work that must be done to get the job done."

On frequency allocations, Mr. Courtney said "The strap that has been lifting the boot in the mobile services since 1948 is now, for all practical purposes, hanging by a thread, and the next small tug will part the strap and the boot forever. I refer, of course, to

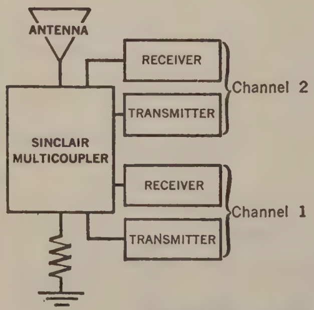
REDUCE ANTENNA INSTALLATION AND MAINTENANCE COSTS UP TO 50%-75%-95%

...WITH SINCLAIR MULTICOUPLERS AND DUPLEXERS

Now you can use one antenna to transmit and receive several channels at once! No interference between channels! All channels can transmit and/or receive simultaneously! A block diagram of a typical installation is shown at lower left. The selection of the proper multicoupler depends on the frequency separation of adjacent equipments, the power level used, and the insertion loss that can be tolerated. We have units to fit your particular requirements.

Write today stating your requirements and discover how much you can save by using Sinclair Multicouplers and Duplexers for your installation.

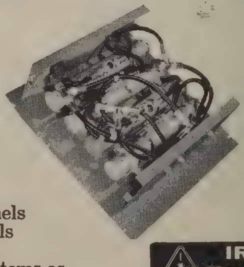
DUPLEXER
Model H-150-2A
150 — 175 MC



FEATURES
- High Isolation
- Low Insertion Loss
- No Maintenance
- Low Initial Cost

FREQUENCIES
20 MC to 10 KMC

TYPICAL APPLICATIONS
- 2 or more Simplex Channels
- 2 or more Duplex Channels
- 1 or more Repeaters
- Up to 12 Multicoupled Systems as standard—Special units available for more than 12 systems.

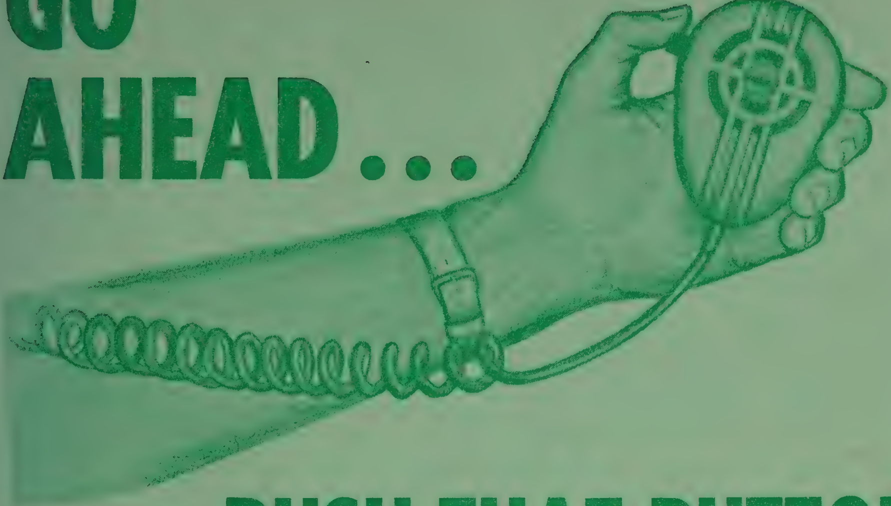


IRE SHOW
March 26-29, 1962
New York City

See our Booth - 1337

SINCLAIR RADIO LABORATORIES, INC.
260 DELAWARE AVE. DEPT. 3CH BUFFALO 2, N. Y.

GO AHEAD . . .



PUSH THAT BUTTON!

NOW — were you satisfied with the chain of events that followed? When you press your microphone button, do you command all of the communications range and coverage that you need?

In Short—

Are you satisfied with the service you get day-in and day-out with your two-way communications system?

Many phases of present day two-way communications are ham-strung by 1940-ish frequency allocations, operating techniques and engineering. **But** — the face of two-way radio is changing fast, daily, and the year ahead promises to show more concrete progress than any year in the past.

To keep your world of two-way radio informed, current and progressive, Communication Horizons reports to you monthly within these pages on the important technical developments, FCC actions, systems engineering and new products that **you need to know about** to keep your communications system performing at peak efficiency.

TODAY — fill in the subscription form on the reverse side of this card, entering your 12 month (or longer) order for the very latest in current news of the Communications Field.

YES—ENTER MY SUBSCRIPTION TODAY

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P.O. Box 3206
Modesto, California

In The April Communication Horizons

A brand new monthly column for service shops
by
I. KAY REDD, JR.
General Electric MR and operator of
MOBILE COMMUNICATIONS, INC.
Silver Spring, Maryland

MR. REDD'S TOPIC FOR APRIL . . .
CONTRACT SERVICE vs PER JOB SERVICE

the channel splitting and the other advances in the art which have been forced upon the non-broadcast users alone, and accepted (at their great economic expense, incidentally) on the grounds that in no other way could sufficient frequencies be made available.

"I refer particularly to the outstanding Commission proposal to make a further razor-sharp channel reduction in the business radio service assignments which the EIA has suggested may be in advance of the present state of the equipment art in the same area of operations. Once those splits are made available, they will be immediately used. If the use doesn't work out, then not only the new users suffer but the existing stations on both 15 kc adjacent channels also suffer degradation of service."

FORD TO 'INSTALL' CB SETS

The Ford Motor Company has announced that its 8,000 dealers will be offering Raytheon CB equipment as optional extra equipment on the entire line of Ford cars and trucks throughout 1962.

Ford dealers will not stock the Raytheon units, but rather will offer the five channel Ray-Tel ($189.50) as optional extra equipment, installed, and receive delivery from Raytheon via airfreight.

Neither Raytheon or Ford specified whether the local Ford dealers will be doing the installation work, or, whether the sets will be sold as single units or in pairs. Presumably, the units would be sold in pairs to meet FCC regulations covering Class D radio, in which case the question of who would install the base station unit remains a further "good" question.

Perhaps this will be a *typical* conversation between a *typical* Ford customer and a *typical* Ford dealer, in the months to come.

"Come on Charlie . . . buy this Fairlane and I'll throw in a two-way radio."

"Two-way what? Who do I talk to?"

"Charlie haven't you heard? This two-way citizens radio stuff is the greatest thing since Henry Ford. You can talk to your wife, the guy at the gas station, maybe even the mayor . . . he's a ham or something."

"Could I talk to my aunt . . . she lives in Toronto?"

"Sure . . . *why not* . . . come on . . . buy this car and you'll be a man of prestige and have a ball . . . with a two-way radio and the works."

"I don't know . . . is it complicated?"

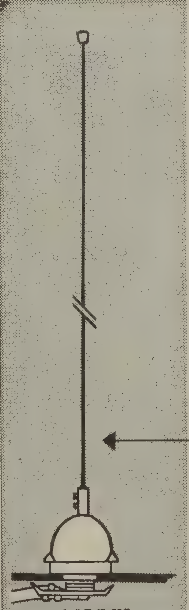
"Nah . . . you just push the button and talk. Easier than operating your television set."

"OK I'm sold. Get me a red radio with purple lights. My wife likes purple."

Ad infinitum.

MORE FREQUENCIES FOR NORTHWEST

The FCC proposes changing Part 11 of its rule governing the Industrial Radio Services to assign seven frequencies in the 153 and 158 megacycle bands to the Power Radio Service for use in the States of Oregon and Washington. These frequencies were assigned in 1958 to the Forest Products

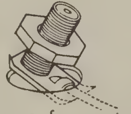


MODEL
No. TG-1-R
(144-470 mc.)
PAT. PEND.

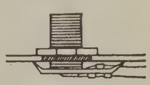
AVOID
CEILING BULGE

G.A.M. offers an antenna mount for interchangeable antennas or any other purpose where an electrical connector is necessary.

MODEL No. TGM-R
EASY TO INSTALL
no need to remove upholstery!



Mounts from outside by insertion through 7/8" hole.



Mounts flat; only uses 3/8" inside roof.

MODEL No. TG-1-R

- Will stand up to 150 watts RF power.
- Stainless spring steel whip 1/4 wave long. May be cut to your specific frequency.
- 144 to 470 mc.
- Comes complete with 12 foot cable, factory installed.

LIST PRICES

TG-1-R (incl. mount)	$8.25
TG-1-R (w/o mount)	$2.50
TGM-R (no antenna)	$6.25

SEE YOUR DISTRIBUTOR OR WRITE GAM DIRECT

G·A·M Electronics Inc.
138 Lincoln St., Manchester, N. H.

and Petroleum Radio Services which have made little use of them.

The Commission granted a petition by the National Committee for Utilities Radio to this extent but deferred consideration of a like request for Arkansas, Louisiana, Oklahoma and Texas. It also denied another NCUR petition for assignment of additional power frequencies in the 152-162 and 450-470 mc band on a national basis.

PROPOSED ELIGIBILITY IN AUTO EMERGENCY

The Commission invites comments to Notice of Proposed Rule Making looking toward amending Part 16 of the Land Transportation Radio Services rules to redefine the Automobile Emergency Radio Service to mean a radio communications service for use in connection with the dispatching of emergency road service vehicles for the purpose of assisting disabled autos on streets and highways, and to expand the eligibility by including any person engaged in providing to the general public any form of such emergency road service, without regard as to whether that person operates a public garage.

FCC WOULD CHANGE INDUSTRIAL TOLERANCES

The Commission invites comments to Notice of Proposed Rule Making looking toward amending Part 11 of the rules to change the allowable percentage of frequency tolerance from within 0.01 percent to within 0.005 percent of the assigned frequency for all base and fixed stations operating on frequencies below 25 megacycles, at more than 300 watts input. This will comply with the terms of the 1959 Geneva Conference. Licensees will have 90 days to make the adjustment.

LOGBOOK

A handy calendar of important meetings and events of interest to mobile communications*

February 26—Washington (D.C.) Chapter meeting of IRE PGVC.

March 1—Comment deadline on FCC proposal to permit the operation of low powered transmitters on frequencies in the police, fire and local government radio services for intruder or burglar alarm purposes.

March 5-7—Meeting of Mississippi Valley Region of American Association of State Highway Officials on use of two-way radio by highway departments. Haven Hill, near Pontiac, Michigan.

March 9—Annual meeting of Operational Fixed Microwave Council. Statler Hotel, Washington, D. C .

March 26—Washington (D.C.) Chapter Meeting of IRE PGVC.

March 26-29—International Radio and Electronics Show and IRE International Convention. Waldorf-Astoria Hotel and New York Coliseum, New York City.

March 30—Comments due on FCC proposal to expand eligibility in auto emergency radio services to include any person engaged in providing any form of emergency road service to public, whether or not applicant operates a public garage.

April 2—Comment deadline on FCC proposal to withdraw seven 153 and 158 mc frequencies from petroleum and forest products services in Oregon and Washington and allocate them to power service there.

April 10-11—Annual Meeting of Petroleum Industry Electrical Association. Dallas, Tex.

April 11—Virginia Chapter Meeting of Associated Public-Safety Communication Officers. Virginian Hotel. Lynchburg.

April 11-13—Southwest IRE Conference and Electronics Show, Rice Hotel, Houston, Texas.

April 30—Washington (D.C.) IRE PGVC.

May 1—Comments due on FCC proposals to service—allocate the new split channels in the 25-42 mc mobile radio band.

May 16—Metropolitan New York Chapter Meeting of IRE Professional Group on Vehicular Communications.

May 16-18—Annual convention of Industrial Communications Association. Sheraton Chicago Hotel. Chicago.

May 18—Los Angeles Chapter Meeting of IRE Professional Group on Vehicular Communications.

May 28—Washington (D.C.) Chapter Meeting of IRE Professional Group on Vehicular Communications.

June 15—Los Angeles Chapter Meeting of IRE PGVC.

August 7-10—National conference of Associated Public-Safety Communication Officers. Harrison Hotel. Clearwater, Fla.

August 21-24—Western Electronics Show and Convention. Ambassador Hotel and Memorial Sports Arena, Los Angeles.

March 31, 1963—Licensees in the automotive Emergency service, as of April 1, 1958, may continue to operate on 35.70 mc or 35.98 mc until this date. Such users may, on or before this date, convert to the business radio service without changing frequency, or remain in the auto emergency service by changing frequency.

***If we have omitted a date of importance to the industry, drop CH Washington Bureau Chief Robert E. Tall a line at 1327 F Street N. W., Washington 5, D.C., and we will try to include it next month.**

CH SHOWCASE

NEW PRODUCTS IN THE PROFESSIONAL COMMUNICATIONS FIELD

LIGHTWEIGHT PAGER

Motorola has introduced a new lightweight radio pager that provides selective voice communications at an operating cost of less than a penny a day.

The unit is designed to operate within radio paging systems used in plants, hotels, department stores, hospitals, banks, restaurants and other buildings. When paged, the alerting tone sounded in the unit is followed by a voice message. Only the individual pager hears the message.

The fully transistorized pager weighs only 4.5 ounces and measures 4½ inches high, 2⅛ inches wide and 11/16 inches thick. It is designed for shirt pocket carrying or to be clipped to the belt. The unit features a volume control, and is powered by a single mercury cell or typical flashlight battery.

150 WATT POWER AMPLIFIER

Outercom Electronics, Charlotte, North Carolina has announced the development of an 85-150 watt power amplifier for VHF two-way radio communications systems. Three models are available, with power ratings of 85,100 and 150 watts respectively.

Depending on license specification, the POWERcom-500 will boost low powered units up to desired levels, improving coverage areas and reducing or eliminating dead spots.

The POWERcom 500 is the physical mate to the Outercom transceiver and is supplied for immediate connection to the base station unit. It weighs in at 25 pounds. Complete technical data is available from the manufacturer at 502 Charlottetown Mall in Charlotte.

Outercom POWERcom 500 (at right) matches FM-50A transceiver (left) in size and appearance.

NEW FOAM HELIAX

Andrew Corporation, manufacturers of antennas and transmission lines, has announced the development of a flexible coaxial cable which eliminates the need for pressurizing the cable. Foam HELIAX is the only foam dielectric cable to feature all copper connectors and was designed for high quality performance at low installation and service costs, according to the manufacturer.

Foam HELIAX, with type UHF and N fittings attached, is available from stock in two sizes, ½ inch Type FH4 and type FH5, ⅞ inch. Complete information on the new product is available by requesting bulletin 8484 from Andrew Corporation, P.O. Box 807, Chicago 42, Illinois.

NEW CONNECTORS, TERMINALS

Several new product designs providing significant user advantages will be shown at the New York I.R.E. convention by the Sealectro Corporation. The company manufactures "Press Fit" Teflon terminals, "Conhex" subminiature r.f. connectors, and Sealectroboard cordless program boards.

New "Press-Fit" terminal designs include a series of long pigtail lead models that permit a direct conductor path to a component or termination without the need for a second soldering operation. A wide choice of right-angle feedthroughs are also featured, which allow manufacturers to incorporate the inherent advantages of Teflon-insulated terminals on small electronic components.

The "Conhex" sum-miniature r.f. connector highlights a new concept in closed entry design for sub-miniature units. The closed entry design results in better contact and efficient power transfer, as well as greater dependability through elimination of receptacle distortion.

CHEATER CORD FOR TONE SIGNAL GEAR

A "cheater cord," enabling bench check of in-operation tone signaling equipment, is now available from Quindar Electronics Inc., 5 Lawrence Street, Bloomfield, N.J.

The new test unit, designated the QE-5, provides a five foot matched termination plug-in extension cable. By withdrawing Quindar tone signaling modules, receivers, transmitters or power supplies, and using the QE-5 for interconnection between the module and plug-in terminal block, the module can be placed in a more accessible area for maintenance or monitoring while still in operation. This feature eliminates "down-time" of important remote control equipment.

Available for immediate delivery, the QE-5 is priced at $20.00 F.O.B. Bloomfield.

Q.T. SQUELCH

(*Continued From* 12)

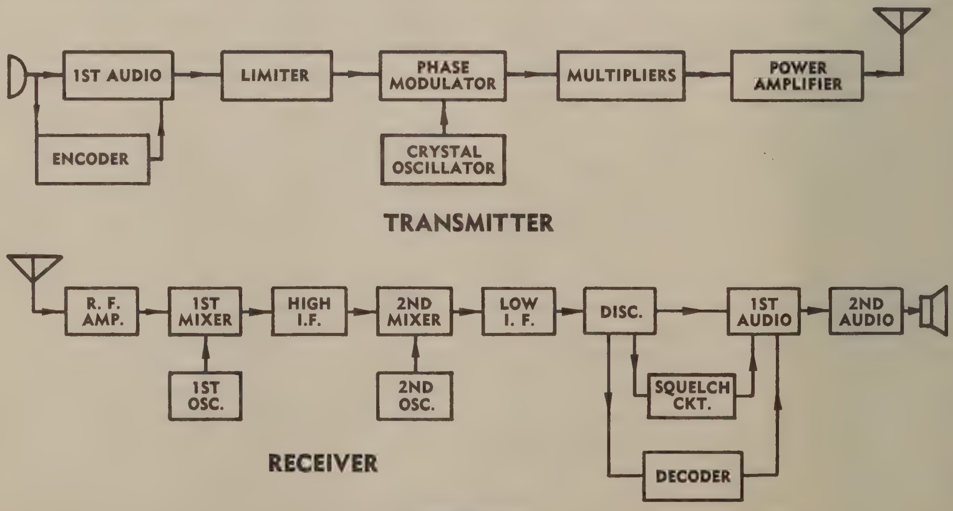


FIGURE 3

switch can be mounted on the communications unit which will provide a listen or quiet condition. With this panel mounted switch, the operator must place his switch in the listen position manually and when he is finished with his message return it to the quiet position if he desires the receiver to be quieted. An important feature of this system is that the dispatcher automatically complies with the FCC ruling, that the operator must first monitor the channel before transmitting.

The block diagram of figure 3 illustrates the operation of the Q-T system.

When the transmitter is keyed, the special Encoder produces a low frequency tone by electrically induced vibrations of a reed. This tone is limited to a .25 second burst by a "burst time" relay. This short burst is then amplified in the first audio tube of the transmitter and sent out before the operator begins to talk. In this way inter-modulation or garbling of the speech in the transmitter is not produced. There is no need for expensive filters in the receiver either, as the tone is not on continuously. It is present only at the beginning of the transmission while the receiver is in the quiet condition, and the major portion of the tone burst will be inaudible because of the time required for the squelch to open. In the receiver, the audio tube is held at cut-off by a relay in the Decoder unit. When the tone is

(*Continued—Page* 28)

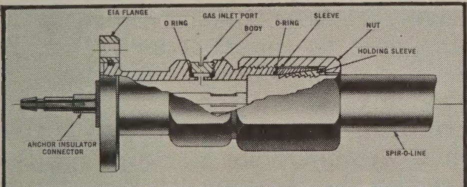
PEOPLE, PLACES *and things*

A Report on Important Personnel, Plant and System Changes During the Past 30 Days

A PATENT 'FIRST' TO PRODELIN

Lewis A. Bondon, President of Prodelin, Inc., Kearny, N.J., and holder of more than 20 patents in the cable and connector fields, has become the first inventor ever granted U. S. Patents for broadband, flexible, air-dielectric, coaxial cables and companion connectors which combine to form a matched transmission line system.

Bondon's patent 3,010,747 describes the construction of a solderless coaxial connector with positive gripping action which, without mechanical distortion, produces a connection equal in strength to the cable sheath itself. The gripping action is secured by using two tapered sleeves. One of these, the holding sleeve, has grooves machined at an angle designed to skive into the cable sheath to any selected depth. A simple principle enables the connector to provide positive mechanical indexing to yield stable VSWR values.



CUTAWAY OF TYPICAL SPIR-O-LOK CONNECTOR

Like the cable, the connector makes possible simple, fast, reliable installations without special tools. And connections can be made repeatedly, without re-dressing tubing or replacing connector parts.

The new cable is marketed under the Prodeline name of Spir-O-line and the connectors under the name Spir-O-lok. Production sizes for 100 degree C service ranges from ⅜ inch to 3⅝ inch O.D., available with or without plastic jacketing. Special high temperature Teflon versions for 250 degree C service are available in the ⅜ inch to 1⅝ inch O.D. sizes.

MOTOROLA FORMS NEW DIVISION

Motorola President Robert W. Galvin has announced the formation of a new company Division to be known as the Solid State Systems Division, with headquarters in Phoenix, Arizona.

The new Division, under the leadership of Dr. H. William Welch, Jr., joins the Communications, Military Electronics and Semi Conductor Products Divisions now reporting to Dr. Daniel E. Noble, Executive Vice President and a Director of Motorola.

Primary mission of the new Division is the application of integrated solid state technology to the development of electronic materials, devices, and equipment for use in communications, microwave and industrial control systems.

OKLAHOMA BROADENS C.D. OPERATION

The first phase of a broadened radio network described as "Oklahoma's first line of communications for civil defense "has been completed with the installation of a new statewide mobile communications system by the Oklahoma Highway Department.

Supplied by General Electric, the network includes 45 base stations and 75 high-powered G-E transistorized Progress Line mobile units installed in cars and trucks to permit communications with division offices.

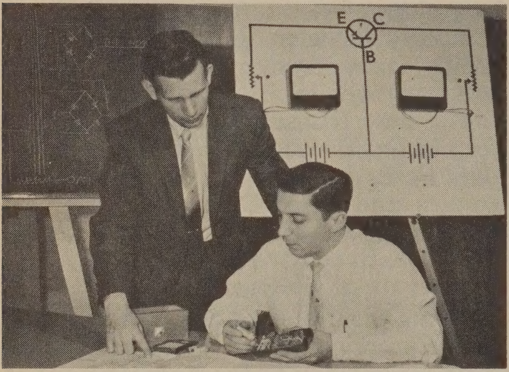
2-WAY IQ . . .

(*Continued From* 8)

drain requirements.

When the total line drop is excessive, the various parts of the system should be checked for voltage drop. If the voltage across the fuse is greater than 0.1 volt, clean the terminals or replace the fuse to reduce the drop across it. If the voltage across the relay contracts exceed 0.075 volts, the contacts should be cleaned or the relay replaced.

If the line drop is still too large, the fault probably lies in the ground return circuit through the vehicle frame. Careful cleaning and re-bolting ground connections to the vehicle frame may correct the problem. The frame connection point should be cleaned and scraped to the base metal. The objective is to keep line drops within permissible limits so that the radio set operates at its rated voltage.



Student technicians learn two-way radio from trained instructors at periodic service clinics held in key cities by firms such as Motorola. Motorola also offers in-plant residence schools and a 38-lesson home study course on radio communications to keep technicians up on the latest servicing technique and two-way equipment.

In 12-volt installations, there is a possibility of excessive voltage which can cause damage to the radio. Adjustment of the vehicle voltage regulator may correct this problem. If not, a special voltage regulator designed to handle this problem should be put in.

ANTENNAS

Antenna systems are often overlooked as a source of trouble and should be inspected periodically for corrosion and damage. Broken antenna rods, shorted transmission lines, waterlogged connectors and corroded parts all constitute a hazard to normal operating efficiency. The antenna, of course, serves both transmitter and receiver and affects the whole radio set.

With these and other basic points checked periodically as part of a solid maintenance program, a two-way radio system will be ready when needed and will give many years of worthwhile service. When sound maintenance procedures like these are combined with continuing proper usage of the network, any organization can consistently get top value from its two-way radio system.

SPLATTER . . .

(*Continued From* 1)

communications industry . . . the largest single grouping of communications users in this nation . . . can find a common footing for the formation of a united front.

We don't profess to know where the grass roots support for such an all encompassing organization might lie, but we suspect that the place to start looking for such support is the EIA. Granted, the EIA represents the manufacturers . . . not the users. But the user would be naught were it not for the manufacturers. In this case the chicken *does* come before the egg. The question is simply one of "how do we scramble the eggs into an omelet?"

Q.T. SQUELCH . . .

(*Continued From* 26)

received in the communications unit it activates a reed that is tuned to the same tone as the Encoder. When the Decoder reed vibrates, it causes the relay to drop out for 7 to 13 seconds permitting the receiver to come alive. After the time delay the relay pulls in silencing the receiver. To keep the receiver alive for a longer time, the alive-time delay can be adjusted from 3 to 30 seconds. There are 4 tone frequencies available in the Encoder and Decoder sets. If the factory set frequency is undesirable, minimum effort is required to change the frequency in the field to one of the remaining three frequencies, as only one lead has to be changed in the Decoder and a mask has to be moved in the Encoder.

efficient
twin-tetrode
permits

compact

UHF
packaging,
plus
circuit economy

Got a design on the board for a mobile transceiver, broadband amplifier, TV link, or equipment used for telemetering radio links? Then you'll want to consider Amperex 7377. The unique construction of this remarkably efficient tube permits exceptional circuit compactness, economy and reliability. And 7377 exhibits these impressive characteristics: Delivers 12.5 watts output (ICAS) at 470 Mc., 5 watts at 960 Mc. • Extremely low push-pull plate output capacitance • Internally neutralized plate-to-grid capacitance • High transconductance (10,500 micromhos) • High gain and high figure of merit

TYPE 7377 TYPICAL OPERATION, CLASS C AMPLIFIER

	ICAS	ICAS	
Frequency	470	960	Mc.
D.C. Plate Voltage	300	250	V.
D.C. Grid #2 Voltage	170	170	V.
D.C. Grid #1 Voltage	–25	–15	V.
D.C. Plate Current	2x40	2x40	ma
D.C. Grid #2 Current	17	15	ma
D.C. Grid #1 Current	2.5	1.5	ma
Drive Power	1.4	1.4	watts
Load Power Output	12.5	5	watts

ask Amperex about tubes for RF, VHF and UHF applications

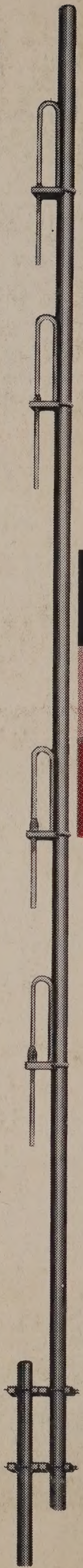
Amperex® Electronic Corporation
230 Duffy Avenue, Hicksville, Long Island, New York

In Canada: *Philips Electronics Industries Ltd., Tube, Semiconductor & Component Depts., 116 Vanderhoof Avenue, Toronto 17, Ontario*

FOR MAXIMUM 150 MC OPERATION

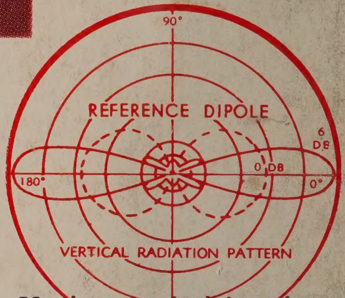
9.5

DB GAIN



The Model SD-150 Jaypole is a stacked antenna for commercial application, developing 9.5 db gain in one favored direction, with 6 db gain on the sides and 2 db gain to the rear, or 6.1 db gain omnidirectionally with equal orientation of the jaypole positions. Extremely broad band response is maintained with optimum performance for duplex, multi-frequency or mobile relay operation. Construction is designed for weatherability, ease in assembly and operational qualities. All metal surfaces iridite treated to military specifications. Overall length, 21 ft. Wind area, 2.2 sq. ft. Wind load, 70½ lbs. at 100 mph. Bending moment is 618 lbs. at top clamp. Models available to cover 148-159 mc, 159-174 mc and special frequencies.

The commercial line also includes mobile whips and base station antennas for the 150 mc frequencies. Complete technical information available from Hy-Gain on request.



50 ohms nominal impedance
VSWR: 1.2 to 1 at resonance
1 KW maximum power input
Approx. 18 degrees vertical beam width at 50% power

hy-gain
antenna products
Dept. 353
1135 North 22nd St.
LINCOLN, NEBRASKA